

Table 1

(1) Comparison of the Present Invention and the Cited Reference

Publication No.		Present Invention	NSC/Tamehiro
Filing Date or Publication Date		2004SN00625	WO96/23909
Application filed		2003.1.14	1996.8.8
What is claimed is			
Component (mass%)	C	0.03-0.1	0.05-0.10
	Si	0.01-0.5	≤0.6
	Mn	1.2-2.5	1.7-2.5
	P		≤0.015
	S		≤0.003
	Al	≤0.08	≤0.08
	Nb	0.005-0.07	0.01-0.10
	V	0.005-0.1	0.01-0.10
	Ti	0.005-0.04	0.005-0.030
	Cu	≤0.5	0.1-1.2
	Ni	≤0.5	0.1-0.6
	Cr	≤0.5	0.1-1
	Mo	0.05-0.4	0.15-0.60
	B	≤0.005	0.0003-0.0020
	Ca	0.0005-0.003	0.001-0.006
	N		0.001-0.006
	REM		0.001-0.02
	Mg		0.001-0.006
	C/(Mo+Ti+Nb+V)	1.2-3	
	P value		
Metal structure		Ferrite-bainite-MA MA fraction: 3-20% Complex carbon nitride of grain size of less than 10nm is precipitated in ferrite	Martensite-ferrite-bainite Ferrite fraction: 20-90% Ratio of worked ferrite in ferrite: 50-100%
Process of making	Heating temperature	1000-1300	950-1300
	Rolling finish temperature	≥Ar3	650-800
	Rolling reduction rate		50% or more at 950°C or more 10-70% in two-phase region of Ar3-Ar1 points
	Cooling rate	≥5°C/s	Air cooling or accelerated cooling at 10°C/s
	Cooling stop	450-650	≤500°C
	Heating rate	≥0.5°C/s	
	Reheating temperature	550-750	
	Pipe forming		
Mechanical		Low yield ratio	Low yield ratio

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